Topics Covered in Lecture 20

12-September-2002

- Renewal Processes.
  Let S_k denote the time from the beginning until the occurence of the kth event

$$S_k = X_1 + X_2 + \ldots + X_k,$$

$$\begin{aligned} P[N(t) = n] &= P[S_n \leq t < S_{n+1}] \\ &= P[S_n \leq t] - P[S_{n_1} \leq t] \\ &= F^{(n)}(t) - F^{(n+1)}(t). \end{aligned}$$

- The **renewal function** *m(t)* can be defined as the average number of renewals in the interval (0, t]:

$$\begin{aligned} m(t) &= E[N(t)] \\ &= \sum_{n=0}^{\infty} nP[N(t) = n] \\ &= F(t) + \sum_{n=1}^{\infty} F^{(n+1)}(t). \end{aligned}$$

$$F^{(n+1)}(t) = \int_0^t F^{(n)}(t-x) f(x)\, dx,$$

$$m(t) = F(t) + \int_0^t m(t-x) f(x)\, dx.$$

- Availability Analysis:

$$\text{MTBF} = E[X_i] = E[T_i + D_i] = E[T_i] + E[D_i] = \text{MTTF} + \text{MTTR}$$

$$L_f(s) = L_w(s) L_g(s)$$

$$L_d(s) = \frac{L_w(s) L_g(s)}{1 - L_w(s) L_g(s)}.$$

$$A(t) = R(t) + \int_0^t R(t-x)d(x)dx.$$

$$L_A(s) = \frac{L_R(s)}{1 - L_F(s)}$$

$$A = \frac{\text{MTTF}}{\text{MTTF} + \text{MTTR}}$$

- Chapter 6 is over.